probably to be regarded as vestigial cells which have been supplanted by other mesenchyme cells.

A Case of Compensatory Regeneration in Hydroides dianthus: C. ZELENY. (Read by title only.)

Primary Hexamerism in the Rugosa (Tetracoralla): J. E. DUERDEN. (Read by title only.)

Numerous serial sections of the rugose coral, *Lophophyllum proliferum* (McChesney), prepared for the author by the United States National Museum, enable him to confirm the observation of Pourtalès in 1871 that six primary septa occur at the tip of the corallum. Duncan and Kunth have independently found the Palæozoic *Heterophyllia,* and Frech the Devonian *Decaphyllum,* likewise to be primarily hexameral, while apparently no sections of any rugose types have been described revealing only the four primary septa which are usually assumed to be characteristic of the Tetracoralla. There is good reason for concluding that the Palæozoic corals were primarily hexameral, as is the case with modern corals and actinians (Ceriantheæ excepted).

The serial sections of *Lophophyllum* beyond the tip permit of the order of appearance of the later septa being established. These are found to arise in bilateral pairs within four of the primary interseptal chambers in conformity with Kunth's law. Instituting a comparison of this method of septal increase with what is known of the mesenterial and septal succession in modern Zoantharia, it is shown that the rugose corals are very closely related to the living Zoanthid polyps. In the latter new mesenteries appear at one region within only two primary exocœlic chambers, while in the Rugosa they must have appeared in the same manner within four primary chambers and rarely within six. The Zoanthids probably bore much the same relationship to the corals of Palæozoic times which the actinians of today bear to recent corals.

The Course of the Blood Flow in Lumbricus: SARAH WAUGH JOHNSON. (Reported by J. B. Johnston.)

The course of the blood flow in *Lumbricus terrestris* was studied by watching the pulsations, cutting the vessels, holding with forceps, and by various combined and indirect experiments. The main result is to show that the circulation in *Lumbricus* is not fundamentally a segmental one, upon which a partial systemic circulation has been superimposed, but is wholly systemic. The blood flows forward in the dorsal vessel to the extreme anterior end of the worm, downward in the hearts, and in both directions from the hearts in the ventral vessel. The flow is backward in the subneural vessel and upward from the subneural to the dorsal in the parietals. From the ventral vessel the blood goes to the intestine, body wall, and nephridia. From these organs it is gathered up by the dorso-intestinals, branches of the subneural, and parietals, and emptied into the dorsal. Thus the blood is carried backward by the longitudinal trunks on the ventral side of the body, upward through the body wall, intestine, nephridia, etc., to the dorsal, and forward in the dorsal to the hearts. Since the flow is upward in all the circular vessels, no complete circuit within a single segment is possible for any part of the blood. In the anterior end of the worm blood is carried forward by both the dorsal and ventral vessels, and backward by the subneural and lateral vessels. The latter have connections in several segments with the subneural, anastomose with the parietals of segments XII. and XIII., receive blood from the body wall, nephridia, and seminal vesicles, and empty

into the dorsal vessel in segment X. and, by way of the parietals, in segments XII. and XIII. This system is to be considered as representing the parietal vessels of the region in front of the last pair of hearts.

A Contribution to the Arterial System in Cryptobranchus: H. H. Keener.

Presented by J. B. Johnston. (Read by title only.)

The Larva of Naushonia crangonoides: Millett T. Thompson.

It was my good fortune, while at Woods Holl last summer, to identify and rear the larvæ of *Naushonia crangonoides* (Kingsley), a small Thalassinid Crustacean taken near Wood's Holl in 1893.

Three zoëa and two mysis stages are recognizable, during which stages the metamorphosis is inconsiderable, the 'habitus' being similar in all. The mysis phase, however, closes with a sharp change, the adolescent phase resembling the adult more closely than is usual among the Crustacea. The zoëa and mysis phases of this species are distinguished from all other known Crustacean larvæ—with two exceptions—by their peculiar form. The carapax is elongated behind the eyes into a 'neck'; the rostrum is short and arcuate; the body is without spines, though the anterior abdominal segments bear hook-shaped processes at their posterior angles; the sixth segment of the abdomen is very elongate. The mandibles are remarkably asymmetrical, although symmetrical in the adolescent stages and hence probably in the adult.

Two other larvæ resemble these in form; a larva of unknown parentage from the English coast, in regard to whose mandibles data are lacking; and the well-known larva of *Calliaxis adriatica* (Heller). The mandibles of the latter are like those of the *Naushonia* larva in shape, and similarly the one on the left is hook-shaped and the one on the right conical. Leaving out of the question the too little known English form, we find that the likeness between the larvæ of *Naushonia* and those of *Calliaxis* is not due to convergence, but to a close relationship existing between the species. This is easily demonstrable by comparing the adults of the two species.

Calliaxis and *Naushonia* do not seem to be very closely related to the other species grouped in the Thalassinidea, excepting possibly *Laomedia* (DeHaan). They perhaps represent a group which has approached the Thalassinidea in some respects, but whose descent must be sought along a different line from that of the other genera of this group.

On the Spinal Homologues of the Cranial Nerve Components: J. Playfair McMurrich.

The researches of Strong and C. J. Herrick have demonstrated the existence in the cranial nerves of five distinct components which may be termed the lateral line, somatic sensory, viscero-sensory, median motor and lateral motor components. The first of these are undoubtedly confined to the cranial region, but of the other four it seems probable that homologues exist in the spinal nerves. The somatic sensory components, being supplied to the skin, are naturally to be homologized with the components of the dorsal spinal roots which have a similar distribution, and the equivalents of the viscero-sensory fibers, distributed to the endodermal sense-organs and epithelium, are to be looked for in those sensory fibers from the posterior root ganglia which accompany the efferent fibers of the sympathetic system to the viscera.

As regards the two motor components, the homologues are not so apparent. The observations of van Wijhe have shown that the cranial muscles belong to two categories, the musculature of the branchial